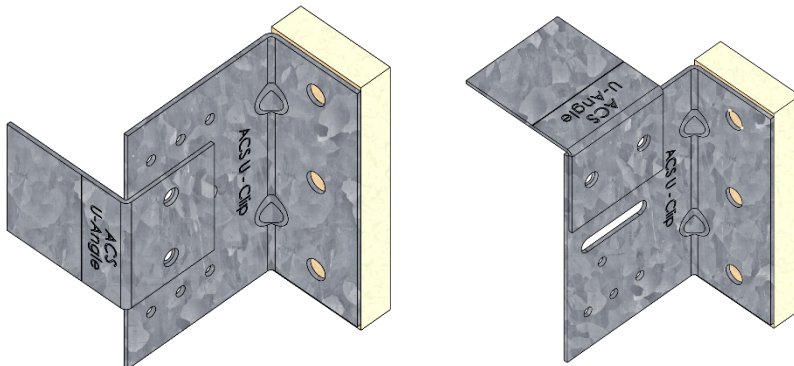




ACS U-CLIP™

Structural Design Guide

Updated: 2026/08/10

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INTRODUCTION

This structural design guide is intended to aid with properly specifying the attachment and spacing of the ACS U-Clip™ for supporting exterior cladding assemblies.

The ACS Universal Clip, or U-Clip™, creates a highly efficient attachment system that reduces the effects of thermal bridging. Composed of galvanized steel and utilizing the ACS Thermal Pad, the ACS U-Clip™ provides a balance between performance, ease of use and cost.

The ACS U-Clip™ is designed for use in wall assemblies with [steel studs, concrete or wood](#) and is available in the following sizes:

| 2" | 3" | 4" | 5" | 6" | 7" | 8" |

The primary function of the ACS U-Clip™ is to support the exterior cladding. This is accomplished by attaching continuous girts (horizontal or vertical rails) to the U-Clip directly or by attaching the ACS U-Angle™. There are four primary installation methods that dictate how these girts are configured with the U-Clips:

- 1) Vertical Angle: U-Angle is omitted. Angle-girt side-fastened directly to the U-Clip.
- 2) Vertical Z-Girt: Vertical z-girt fastened into the face of the U-Angle.
- 3) Horizontal Angle: Horizontal angle-girt fastened to the top of the U-Angle.
- 4) Horizontal Z-Girt: Horizontal z-girt fastened into the face of the U-Angle.



1 - Vertical Angle



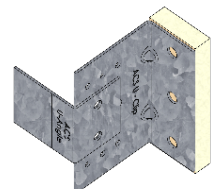
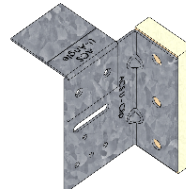
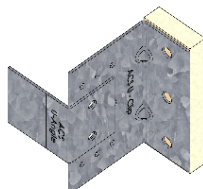
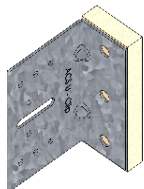
2 - Vertical Z-Girt



3 - Horizontal Angle



4 - Horizontal Z-Girt



*For the above cases, the continuous girt would either receive the specified cladding product, or in situations that call for another plane of girts (e.g. face-fastened systems where symmetric fastener layout is required), the inner girts attached to the thermal clips would support another plane of girts perpendicular to the first plane.

KOLOT STRUCTURAL ENGINEERING LTD.

10 August 2026

ACS Composite Systems Inc.
35 – 7450 Butler Road
Sooke, BC V9Z 1N1

Dear ACS Composite Systems,

KSEL is pleased to provide the attached ACS Structural Design Guide. This document relates to the ACS Galvanized Steel Thermal Clips (U-Clips) installed on concrete, steel stud, wood stud, and plywood sheathed walls.

The thermal clip design has been based on a combination of analytical design, structural verification from an accredited third-party testing agency, as well as manufacturer data for fasteners for the above-mentioned structural backup assemblies.

It should be noted that due to the complexity of cladding/sub-girt types, local/national building codes, wind/seismic loads due to building location, shape, and size, the design of the complete wall assembly is outside the scope of this structural manual. Each project generally requires a cladding specialty engineer (structural engineer) independent of ACS and KSEL, competent in the design of cladding/wall assemblies, and registered in the region that the cladding assembly is to be installed.

ACS Thermal Clips must be installed in accordance with this Structural Design Guide and any amendments hereto. Failure to do so could lead to failure of the clips and/or damage to or loss of support of the cladding and, furthermore, would render void any warranty and liability of ACS or KSEL, including any liability for resulting loss, damage, or costs. Thus, it is very important for the installation to be carried out in accordance with the specifications and instructions herein and with reliance upon an independent project structural engineer as noted in the said Guide.

Best regards,



Doug Kolot, P. Eng., Struct. Eng.

Kolot Structural Engineering Ltd. (KSEL)
EGBC Permit #1000920

STRUCTURAL CONCEPT

Structurally, the clips resist gravity load (cladding assembly self-weight), and transverse loads (wind/seismic). Clip length, spacing, and attachment to the substructure is determined based on the combination of thermal and structural requirements of the assembly.

Gravity load creates both a rotational force and a direct shear in each clip, while wind/seismic forces create a direct tension (or compression) force through each clip. The gravity rotational force is resisted by screw tension in the upper attachment screw and the lower compression region of the clip for the rotational force, and by both screws in direct shear/bearing in the case of direct shear, while wind/seismic forces are resisted by direct screw tension.

While the ACS Thermal Pad (thermal break between the ACS U-Clip™ and the structure) is a minimally compressive material when correctly installed, the overall system installation guidelines have been limited by permissible strain in the ACS Thermal Pad/clip rotation. Clip spacing is also limited by attachment screw capacity, steel clip capacity and ACS U-Angle™ attachment screw capacity (see below for full definitions). These values were calculated and subsequently verified by an independent testing lab with the following tests:

Independent Testing:

- ICC-ES AC308, Acceptance Criteria for Exterior Wall Coverings of Steel-Backed Veneer Panels Attached to Walls Utilizing Steel Framing and Brackets, Approved October 2008 – Section 3.8.2 Gravity Loads
- ASTM E330/E330M-14, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference
- 6" and 10" ACS Thermal Clips – Stress-Strain Load Testing to Failure. Intertek Test Report dated 2024 01 22

The following structural design information is provided as a convenience for the user to determine the general suitability of the clips as part of an overall cladding system. Fastener values are based on one manufacturer's test data and are representative of that manufacturer's fasteners, steel section used, and test apparatus. These values may not be applicable for other screw manufacturers, or to different structural support members.

Due to the number of variables inherent in the design of exterior cladding, structural review of cladding installations is required on any project. These variables include, but are not limited to:

- | | |
|--|--------------------------------------|
| - Building Height | - Building Exposure |
| - Cladding Weight | - Cladding Flexibility / Brittleness |
| - Design Wind Pressure | - Cladding Fastening Requirements |
| - Cladding Assembly Depth | - Substructure Material Type |
| - Substructure Construction Tolerances | |

Additionally, cladding which is inherently prone to cracking such as stucco or some types of stone veneer, may require more onerous structural constraints or safety factors over and above those indicated here to reduce the probability of cracking during the design life of the wall assembly.

As a result of the large number of variables involved with cladding design, a project structural engineer (independent of ACS) is required to review and provide the necessary design/assurance that the overall system is structurally acceptable.

RECOMMENDED CLIP SPACING

Tabulated spacing indicated is based on least of:

- Maximum 1/8" (3.2 mm) deflection due to cladding gravity load (equivalent to 20 lbs of cladding weight on nominal 11" wall assembly depth)
- Screw pullout/tension, shear/bearing, and combined tension/shear interaction for relevant screws
- For U-Clip attachment screws (2 - #12-14 x 3/4" TEKS, Vallow = 2 x 519 = 1038 lbs)
- Other limiting conditions that must be addressed by the project specific engineer including, but not limited to: Sub-structure girt strength/deflection, cladding span/connections to sub-girt assembly, and all load-path screw connections.

Charts Represent Wall Assembly Depth, which is defined as the distance from face of support wall/contact of ACS U-Clip to Center of Gravity (C.O.G.) of cladding (cladding C.O.G. is Typically 1/2 cladding product depth).

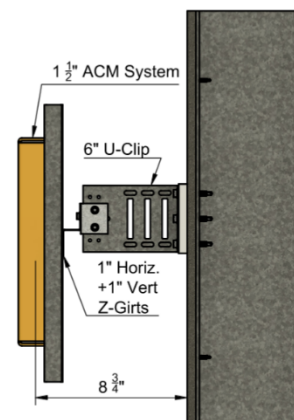
$$\text{Wall Assembly Depth} = [\text{Clip Depth}] + [\text{Sub-Girt(s) Depth}] + [\text{Outer Girt to Cladding C.O.G.}]$$

Example:

6" ACS Thermal Clip, 2x - 1" z-girts (vertical & horizontal girts), 1 1/2" Composite Panel System

$$\text{Total Wall Assembly Depth} = (6'') + (2 \times 1'') + (0.5 \times 1 \frac{1}{2}'') = 8 \frac{3}{4}''$$

Use 9" Wall Assembly Chart



LOAD TABLES

STEEL STUD SUBSTRUCTURE



- ASD screw forces (tension, shear and combined interaction) per AISI S100-16
- Steel Stud assemblies require **3x** ACS-HWH MD2 screws ($\frac{1}{4}" \times 2 \frac{1}{2}"$ Hex Washer Head #2 Drill Point Carbon Steel NZF 3000 Leland Master Driller®).
- For attachment to steel studs, screw length must penetrate beyond the metal structure a minimum of 3 pitches of thread.
- Spacing is shown for 16" horizontal stud spacing. For alternate spacing, multiply table spacing shown for chosen assembly (weight/depth/gauge) by 16"/Project Spacing.
Example: 40 psf, 12" Wall Assembly with 6 psf Weight & 16-Gauge Studs @ 24" o/c
- Vertical spacing is $16"/24" \times 34" = 22.7"$ - Provide clips at maximum 24" H x 22.7" V

UP TO 40 psf SPECIFIED WIND

12" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	48	Vertical Clip Spacing (inches)
4	48	48	43	
5	41	41	38	
6	34	34	34	
7	29	29	29	
8	25	25	25	
10	20	20	20	

10" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	48	Vertical Clip Spacing (inches)
4	48	48	47	
5	48	48	42	
6	41	41	38	
7	35	35	35	
8	30	30	30	
10	24	24	24	

9" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	48	Vertical Clip Spacing (inches)
4	48	48	48	
5	48	48	44	
6	45	45	40	
7	39	39	37	
8	34	34	34	
10	27	27	27	

8" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	48	Vertical Clip Spacing (inches)
4	48	48	48	
5	48	48	47	
6	48	48	43	
7	43	43	39	
8	38	38	36	
10	30	30	30	

7" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	48	Vertical Clip Spacing (inches)
4	48	48	48	
5	48	48	48	
6	48	48	46	
7	48	48	42	
8	43	43	39	
10	35	35	35	

6" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	48	Vertical Clip Spacing (inches)
4	48	48	48	
5	48	48	48	
6	48	48	48	
7	48	48	46	
8	48	48	43	
10	41	41	38	

5" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	48	Vertical Clip Spacing (inches)
4	48	48	48	
5	48	48	48	
6	48	48	48	
7	48	48	48	
8	48	48	47	
10	48	48	42	

4" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	48	Vertical Clip Spacing (inches)
4	48	48	48	
5	48	48	48	
6	48	48	48	
7	48	48	48	
8	48	48	48	
10	48	48	47	

UP TO 60 psf SPECIFIED WIND

12" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	38	Vertical Clip Spacing (inches)
4	48	48	34	
5	41	41	31	
6	34	34	29	
7	29	29	26	
8	25	25	24	
10	20	20	20	

10" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	41	Vertical Clip Spacing (inches)
4	48	48	37	
5	48	48	34	
6	41	41	31	
7	35	35	29	
8	30	30	27	
10	24	24	24	

9" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	42	Vertical Clip Spacing (inches)
4	48	48	38	
5	48	48	35	
6	45	45	33	
7	39	39	30	
8	34	34	29	
10	27	27	25	

8" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	44	Vertical Clip Spacing (inches)
4	48	48	40	
5	48	48	37	
6	48	48	34	
7	43	43	32	
8	38	38	30	
10	30	30	27	

7" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	45	Vertical Clip Spacing (inches)
4	48	48	42	
5	48	48	39	
6	48	48	36	
7	48	48	34	
8	43	43	32	
10	35	35	29	

6" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	47	Vertical Clip Spacing (inches)
4	48	48	44	
5	48	48	41	
6	48	48	38	
7	48	48	36	
8	48	48	34	
10	41	41	31	

5" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	48	Vertical Clip Spacing (inches)
4	48	48	46	
5	48	48	43	
6	48	48	41	
7	48	48	39	
8	48	48	37	
10	48	48	34	

4" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	48	Vertical Clip Spacing (inches)
4	48	48	48	
5	48	48	46	
6	48	48	44	
7	48	48	42	
8	48	48	40	
10	48	48	37	

UP TO 80 psf SPECIFIED WIND

12" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	46	32	Vertical Clip Spacing (inches)
4	48	42	29	
5	41	39	27	
6	34	34	25	
7	29	29	23	
8	25	25	21	
10	20	20	19	

10" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	33	Vertical Clip Spacing (inches)
4	48	45	31	
5	48	42	28	
6	41	39	27	
7	35	35	25	
8	30	30	23	
10	24	24	21	

9" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	34	Vertical Clip Spacing (inches)
4	48	46	32	
5	48	43	30	
6	45	40	28	
7	39	38	26	
8	34	34	25	
10	27	27	22	

8" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	35	Vertical Clip Spacing (inches)
4	48	48	33	
5	48	45	31	
6	48	42	29	
7	43	40	27	
8	38	38	26	
10	30	30	23	

7" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	36	Vertical Clip Spacing (inches)
4	48	48	34	
5	48	47	32	
6	48	44	30	
7	48	42	29	
8	43	40	27	
10	35	35	25	

6" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	37	Vertical Clip Spacing (inches)
4	48	48	35	
5	48	48	33	
6	48	46	32	
7	48	44	30	
8	48	42	29	
10	41	39	27	

5" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	38	Vertical Clip Spacing (inches)
4	48	48	36	
5	48	48	35	
6	48	48	33	
7	48	47	32	
8	48	45	31	
10	48	42	28	

4" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	48	39	Vertical Clip Spacing (inches)
4	48	48	38	
5	48	48	36	
6	48	48	35	
7	48	48	34	
8	48	48	33	
10	48	45	31	

UP TO 100 psf SPECIFIED WIND

12" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	39	27	Vertical Clip Spacing (inches)
4	45	36	25	
5	41	34	23	
6	34	32	22	
7	29	29	20	
8	25	25	19	
10	20	20	17	

10" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	41	28	Vertical Clip Spacing (inches)
4	48	38	26	
5	45	36	25	
6	41	34	23	
7	35	32	22	
8	30	30	21	
10	24	24	19	

9" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	42	29	Vertical Clip Spacing (inches)
4	48	39	27	
5	46	37	25	
6	44	35	24	
7	39	33	23	
8	34	32	22	
10	27	27	20	

8" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	43	29	Vertical Clip Spacing (inches)
4	48	40	28	
5	48	38	26	
6	45	36	25	
7	43	35	24	
8	38	33	23	
10	30	30	21	

7" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	44	30	Vertical Clip Spacing (inches)
4	48	41	28	
5	48	39	27	
6	47	38	26	
7	45	36	25	
8	43	35	24	
10	35	32	22	

6" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	45	31	Vertical Clip Spacing (inches)
4	48	43	29	
5	48	41	28	
6	48	39	27	
7	47	38	26	
8	45	36	25	
10	41	34	23	

5" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	46	31	Vertical Clip Spacing (inches)
4	48	44	30	
5	48	42	29	
6	48	41	28	
7	48	39	27	
8	48	38	26	
10	45	36	25	

4" Wall Assembly

Cladding Weight (psf)	16-Ga.	18-Ga.	20-Ga.	
	16" (Horiz)	16" (Horiz)	16" (Horiz)	
3	48	47	32	Vertical Clip Spacing (inches)
4	48	45	31	
5	48	44	30	
6	48	43	29	
7	48	41	28	
8	48	40	28	
10	48	38	26	

CONCRETE SUBSTRUCTURE



Concrete
2x
ACS-HWH Concrete/CMU

- Note: Spacing tables apply for 40 psf - 100 psf wind (deflection not fastener limited)
- Screw tension/pullover, shear/bearing, and combined interaction per AISI S100-16 & tested values of fasteners in Concrete/CMU with associated ASD safety factors applied
- Attachment to concrete assemblies requires minimum 4000 psi (28 MPa) concrete with **2x** ACS-HWH Concrete/CMU Hex Head Screw, 1/4" x 2 1/2" Hex Screw, installed in the outermost holes in the clip flange, omitting the center hole screw, minimum 1 1/2" concrete embedment.

40 - 100 psf SPECIFIED WIND

12" Wall Assembly

Cladding Weight (psf)	4000 psf (28 MPa) Concrete		
	16" (Horizontal)	24" (Horizontal)	
3	48	32	Vertical Clip Spacing (inches)
4	48	32	
5	41	27	
6	34	23	
7	29	19	
8	25	17	
10	20	14	

10" Wall Assembly

Cladding Weight (psf)	4000 psf (28 MPa) Concrete		
	16" (Horizontal)	24" (Horizontal)	
3	48	32	Vertical Clip Spacing (inches)
4	48	32	
5	48	32	
6	41	27	
7	35	23	
8	30	20	
10	24	16	

9" Wall Assembly

Cladding Weight (psf)	4000 psf (28 MPa) Concrete		
	16" (Horizontal)	24" (Horizontal)	
3	48	32	Vertical Clip Spacing (inches)
4	48	32	
5	48	32	
6	45	30	
7	39	26	
8	34	23	
10	27	18	

8" Wall Assembly

Cladding Weight (psf)	4000 psf (28 MPa) Concrete		
	16" (Horizontal)	24" (Horizontal)	
3	48	32	Vertical Clip Spacing (inches)
4	48	32	
5	48	32	
6	48	32	
7	43	29	
8	38	25	
10	30	20	

7" Wall Assembly

Cladding Weight (psf)	4000 psf (28 MPa) Concrete		
	16" (Horizontal)	24" (Horizontal)	
3	48	32	Vertical Clip Spacing (inches)
4	48	32	
5	48	32	
6	48	32	
7	48	32	
8	43	29	
10	35	23	

6" Wall Assembly

Cladding Weight (psf)	4000 psf (28 MPa) Concrete		
	16" (Horizontal)	24" (Horizontal)	
3	48	32	Vertical Clip Spacing (inches)
4	48	32	
5	48	32	
6	48	32	
7	48	32	
8	48	32	
10	41	27	

5" Wall Assembly

Cladding Weight (psf)	4000 psf (28 MPa) Concrete		
	16" (Horizontal)	24" (Horizontal)	
3	48	32	Vertical Clip Spacing (inches)
4	48	32	
5	48	32	
6	48	32	
7	48	32	
8	48	32	
10	48	32	

4" Wall Assembly

Cladding Weight (psf)	4000 psf (28 MPa) Concrete		
	16" (Horizontal)	24" (Horizontal)	
3	48	32	Vertical Clip Spacing (inches)
4	48	32	
5	48	32	
6	48	32	
7	48	32	
8	48	32	
10	48	32	

CMU SUBSTRUCTURE



CMU
2x
ACS-HWH Concrete/CMU

- Screw tension/pullover, shear/bearing, and combined interaction per AISI S100-16 & tested values of fasteners in CMU with associated ASD safety factors applied
- Attachment to CMU assemblies required minimum 2000 psi (14 MPa) CMU Block with **2x** ACS-HWH Concrete/CMU Hex Head Screw, 1/4" x 2 1/2" Hex Screw, installed in the outermost holes in the clip flange, omitting the center hole screw, minimum 1 1/2" face shell embedment.

UP TO 40 psf SPECIFIED WIND

9" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	34	23	Vertical Clip Spacing (inches)
4	31	21	
5	29	19	
6	27	18	
7	25	17	
8	23	16	
10	21	14	

8" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	36	24	Vertical Clip Spacing (inches)
4	33	22	
5	30	20	
6	28	19	
7	26	18	
8	25	16	
10	22	15	

7" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	37	24	Vertical Clip Spacing (inches)
4	34	23	
5	32	21	
6	30	20	
7	28	19	
8	26	18	
10	24	16	

6" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	38	25	Vertical Clip Spacing (inches)
4	36	24	
5	33	22	
6	31	21	
7	30	20	
8	28	19	
10	25	17	

5" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		Vertical Clip Spacing (inches)
	16" (Horizontal)	24" (Horizontal)	
3	39	26	
4	37	25	
5	35	23	
6	33	22	
7	32	21	
8	30	20	
10	28	18	

4" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		Vertical Clip Spacing (inches)
	16" (Horizontal)	24" (Horizontal)	
3	41	27	
4	39	26	
5	37	25	
6	36	24	
7	34	23	
8	33	22	
10	30	20	

UP TO 60 psf SPECIFIED WIND

9" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		Vertical Clip Spacing (inches)
	16" (Horizontal)	24" (Horizontal)	
3	25	17	
4	24	16	
5	22	15	
6	21	14	
7	20	13	
8	19	13	
10	17	11	

8" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		Vertical Clip Spacing (inches)
	16" (Horizontal)	24" (Horizontal)	
3	26	17	
4	24	16	
5	23	15	
6	22	15	
7	21	14	
8	20	13	
10	18	12	

7" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		Vertical Clip Spacing (inches)
	16" (Horizontal)	24" (Horizontal)	
3	27	18	
4	25	17	
5	24	16	
6	23	15	
7	22	14	
8	21	14	
10	19	13	

6" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		Vertical Clip Spacing (inches)
	16" (Horizontal)	24" (Horizontal)	
3	27	18	
4	26	17	
5	25	17	
6	24	16	
7	23	15	
8	22	15	
10	20	13	

5" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	28	19	Vertical Clip Spacing (inches)
4	27	18	
5	26	17	
6	25	17	
7	24	16	
8	23	15	
10	21	14	

4" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	29	19	Vertical Clip Spacing (inches)
4	28	18	
5	27	18	
6	26	17	
7	25	17	
8	24	16	
10	23	15	

UP TO 80 psf SPECIFIED WIND

9" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	20	13	Vertical Clip Spacing (inches)
4	19	13	
5	18	12	
6	17	11	
7	16	11	
8	16	10	
10	14	10	

8" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	20	14	Vertical Clip Spacing (inches)
4	19	13	
5	19	12	
6	18	12	
7	17	11	
8	16	11	
10	15	10	

7" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	21	14	Vertical Clip Spacing (inches)
4	20	13	
5	19	13	
6	18	12	
7	18	12	
8	17	11	
10	16	11	

6" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	21	14	Vertical Clip Spacing (inches)
4	20	14	
5	20	13	
6	19	13	
7	18	12	
8	18	12	
10	17	11	

5" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	22	14	Vertical Clip Spacing (inches)
4	21	14	
5	20	14	
6	20	13	
7	19	13	
8	19	12	
10	18	12	

4" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	22	15	Vertical Clip Spacing (inches)
4	22	14	
5	21	14	
6	20	14	
7	20	13	
8	19	13	
10	19	12	

UP TO 100 psf SPECIFIED WIND

9" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	17	11	Vertical Clip Spacing (inches)
4	16	11	
5	15	10	
6	15	10	
7	14	9	
8	14	9	
10	13	8	

8" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	17	11	Vertical Clip Spacing (inches)
4	16	11	
5	16	10	
6	15	10	
7	14	10	
8	14	9	
10	13	9	

7" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	17	11	Vertical Clip Spacing (inches)
4	17	11	
5	16	11	
6	15	10	
7	15	10	
8	14	10	
10	14	9	

6" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	17	12	Vertical Clip Spacing (inches)
4	17	11	
5	16	11	
6	16	11	
7	15	10	
8	15	10	
10	14	9	

5" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	18	12	Vertical Clip Spacing (inches)
4	17	11	
5	17	11	
6	16	11	
7	16	11	
8	16	10	
10	15	10	

4" Wall Assembly

Cladding Weight (psf)	2000 psf (14 MPa) CMU		
	16" (Horizontal)	24" (Horizontal)	
3	18	12	Vertical Clip Spacing (inches)
4	18	12	
5	17	11	
6	17	11	
7	17	11	
8	16	11	
10	16	10	

WOOD STUD SUBSTRUCTURE

See "Plywood Substructure" for direct attachment to sheathing

- Note: Spacing tables apply for 40 psf - 100 psf wind (deflection not fastener limited)
- Screw tension/pullover, shear/bearing, and combined interaction per AISI S100-16 & NDS 2024 for equivalent lag screws with associated ASD safety factors applied
- All assemblies require **3x** ACS-HWH MT screws (#14-10 x 2 1/2" Hex Washer Head Carbon Steel NZF 3000 Leland Master Gripper®) with at least 1 1/2" penetration into studs.
- Spacing is shown for 16" stud spacing. For alternate spacing, multiply table spacing shown for chosen assembly (weight/depth/species) by 16"/Project Spacing.
Example: 40 psf, 12" Wall Assembly with 6 psf Weight & D-Fir Studs @ 24" o/c
- Vertical spacing is 16"/24" x 34" = 22.7" - Provide clips at maximum 24" H x 22.7" V



Wood Stud
3x
ACS-HWH MT

40 - 100 psf SPECIFIED WIND

12" Wall Assembly

Cladding Weight (psf)	Stud Species		
	Douglas Fir (DF)	Spruce-Pine-Fir (SPF)	
3	48	48	Vertical Clip Spacing (inches)
4	48	48	
5	41	41	
6	34	34	
7	29	29	
8	25	25	
10	20	20	

10" Wall Assembly

Cladding Weight (psf)	Stud Species		
	Douglas Fir (DF)	Spruce-Pine-Fir (SPF)	
3	48	48	Vertical Clip Spacing (inches)
4	48	48	
5	48	48	
6	41	41	
7	35	35	
8	30	30	
10	24	24	

9" Wall Assembly

Cladding Weight (psf)	Stud Species		
	Douglas Fir (DF)	Spruce-Pine-Fir (SPF)	
3	48	48	Vertical Clip Spacing (inches)
4	48	48	
5	48	48	
6	41	41	
7	35	35	
8	30	30	
10	24	24	

8" Wall Assembly

Cladding Weight (psf)	Stud Species		
	Douglas Fir (DF)	Spruce-Pine-Fir (SPF)	
3	48	48	Vertical Clip Spacing (inches)
4	48	48	
5	48	48	
6	48	48	
7	43	43	
8	38	38	
10	30	30	

7" Wall Assembly

Cladding Weight (psf)	Stud Species		
	Douglas Fir (DF)	Spruce-Pine-Fir (SPF)	
3	48	48	Vertical Clip Spacing (inches)
4	48	48	
5	48	48	
6	48	48	
7	48	48	
8	43	43	
10	35	35	

6" Wall Assembly

Cladding Weight (psf)	Stud Species		
	Douglas Fir (DF)	Spruce-Pine-Fir (SPF)	
3	48	48	Vertical Clip Spacing (inches)
4	48	48	
5	48	48	
6	48	48	
7	48	48	
8	48	48	
10	41	41	

5" Wall Assembly

Cladding Weight (psf)	Stud Species		
	Douglas Fir (DF)	Spruce-Pine-Fir (SPF)	
3	48	48	Vertical Clip Spacing (inches)
4	48	48	
5	48	48	
6	48	48	
7	48	48	
8	48	48	
10	48	48	

4" Wall Assembly

Cladding Weight (psf)	Stud Species		
	Douglas Fir (DF)	Spruce-Pine-Fir (SPF)	
3	48	48	Vertical Clip Spacing (inches)
4	48	48	
5	48	48	
6	48	48	
7	48	48	
8	48	48	
10	48	48	

PLYWOOD SUBSTRUCTURE



Plywood
3x
ACS-HWH MT

- Screw tension/pullover, shear/bearing, and combined interaction per AISI S100-16 testing with associated ASD safety factors applied
- Sheathing must be exterior grade Douglas Fir Plywood (DFP) sheathing, or Softwood Plywood equivalent to APA Rated PS 1 (designated CSP in tables)
- All assemblies require **3x** ACS-HWH MT screws (#14-10 x 2 1/2" Hex Washer Head Carbon Steel NZF 3000 Leland Master Gripper®) with threads that engage entire plywood thickness and tip to protrude past inside of plywood min 1/4" and
- Spacing tables apply for 16" Horizontal spacing. For alternate spacing, multiply table spacing shown for chosen assembly (weight/depth/species) by 16"/Project Spacing.
Example: 9" Wall Assembly with 6 psf Weight & U-Clips @ 24" o/c & 3/4" DFP
 - Vertical spacing is 16"/24" x 45" = 30" - Provide clips at maximum 24" H x 30" V

UP TO 40 psf SPECIFIED WIND

9" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	3/4"	5/8"	1/2"	3/4"	5/8"	1/2"	
3	48	48	41	48	48	41	Vertical Clip Spacing (inches)
4	48	48	37	48	48	37	
5	48	48	33	48	48	33	
6	45	44	30	45	45	30	
7	39	39	27	39	39	28	
8	34	34	25	34	34	25	
10	27	27	22	27	27	22	

8" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	3/4"	5/8"	1/2"	3/4"	5/8"	1/2"	
3	48	48	43	48	48	43	Vertical Clip Spacing (inches)
4	48	48	38	48	48	39	
5	48	48	35	48	48	35	
6	48	47	32	48	48	32	
7	43	43	29	43	43	30	
8	38	38	27	38	38	27	
10	30	30	24	30	30	24	

7" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	48	45	48	48	45	Vertical Clip Spacing (inches)
4	48	48	41	48	48	41	
5	48	48	37	48	48	37	
6	48	48	34	48	48	34	
7	48	47	31	48	48	32	
8	43	43	29	43	43	30	
10	35	35	26	35	35	26	

6" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	48	47	48	48	47	Vertical Clip Spacing (inches)
4	48	48	43	48	48	43	
5	48	48	39	48	48	40	
6	48	48	37	48	48	37	
7	48	48	34	48	48	34	
8	48	47	32	48	48	32	
10	41	41	28	41	41	28	

5" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	48	48	48	48	48	Vertical Clip Spacing (inches)
4	48	48	46	48	48	46	
5	48	48	42	48	48	43	
6	48	48	39	48	48	40	
7	48	48	37	48	48	37	
8	48	48	35	48	48	35	
10	48	46	31	48	48	31	

4" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	⅝"	½"	¾"	⅝"	½"	
3	48	48	48	48	48	48	Vertical Clip Spacing (inches)
4	48	48	48	48	48	48	
5	48	48	46	48	48	46	
6	48	48	43	48	48	43	
7	48	48	41	48	48	41	
8	48	48	38	48	48	39	
10	48	48	35	48	48	35	

3" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	⅝"	½"	¾"	⅝"	½"	
3	48	48	48	48	48	48	Vertical Clip Spacing (inches)
4	48	48	48	48	48	48	
5	48	48	48	48	48	48	
6	48	48	47	48	48	47	
7	48	48	45	48	48	45	
8	48	48	43	48	48	43	
10	48	48	39	48	48	39	

UP TO 60 psf SPECIFIED WIND

9" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	⅝"	½"	¾"	⅝"	½"	
3	48	46	31	48	48	32	Vertical Clip Spacing (inches)
4	48	42	29	48	47	29	
5	48	39	26	45	43	27	
6	45	36	24	42	40	25	
7	39	34	23	39	37	23	
8	34	31	21	34	34	21	
10	27	27	19	27	27	19	

8" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	⅝"	½"	¾"	⅝"	½"	
3	48	48	32	48	48	33	Vertical Clip Spacing (inches)
4	48	44	30	48	48	30	
5	48	41	28	48	45	28	
6	48	38	26	44	42	26	
7	43	35	24	41	39	24	
8	38	33	22	38	37	23	
10	30	30	20	30	30	20	

7" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	⅝"	½"	¾"	⅝"	½"	
3	48	48	33	48	48	34	Vertical Clip Spacing (inches)
4	48	46	31	48	48	31	
5	48	43	29	48	47	29	
6	48	40	27	47	44	27	
7	48	38	25	44	41	26	
8	43	35	24	41	39	24	
10	35	32	22	35	35	22	

6" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	⅝"	½"	¾"	⅝"	½"	
3	48	48	35	48	48	35	Vertical Clip Spacing (inches)
4	48	48	32	48	48	33	
5	48	45	30	48	48	31	
6	48	42	29	48	47	29	
7	48	40	27	47	44	27	
8	48	38	26	44	42	26	
10	41	34	23	40	38	23	

5" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	48	36	48	48	36	Vertical Clip Spacing (inches)
4	48	48	34	48	48	34	
5	48	47	32	48	48	32	
6	48	45	30	48	48	31	
7	48	43	29	48	47	29	
8	48	41	28	48	45	28	
10	48	37	25	43	41	25	

4" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	48	37	48	48	38	Vertical Clip Spacing (inches)
4	48	48	35	48	48	36	
5	48	48	34	48	48	34	
6	48	48	32	48	48	33	
7	48	46	31	48	48	31	
8	48	44	30	48	48	30	
10	48	41	28	48	45	28	

3" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	48	39	48	48	39	Vertical Clip Spacing (inches)
4	48	48	37	48	48	38	
5	48	48	36	48	48	36	
6	48	48	35	48	48	35	
7	48	48	33	48	48	34	
8	48	48	32	48	48	33	
10	48	45	30	48	48	31	

UP TO 80 psf SPECIFIED WIND

9" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	37	25	44	41	26	Vertical Clip Spacing (inches)
4	48	35	24	41	38	24	
5	47	32	22	38	36	22	
6	44	30	21	35	33	21	
7	39	29	19	33	31	19	
8	34	27	18	32	30	18	
10	27	24	16	27	27	17	

8" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	38	26	45	42	26	Vertical Clip Spacing (inches)
4	48	36	24	42	39	24	
5	48	34	23	39	37	23	
6	46	32	21	37	35	22	
7	43	30	20	35	33	20	
8	38	28	19	33	31	19	
10	30	26	17	30	28	18	

7" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	39	27	46	43	27	Vertical Clip Spacing (inches)
4	48	37	25	43	41	25	
5	48	35	24	41	39	24	
6	48	33	22	39	36	23	
7	46	32	21	37	35	21	
8	43	30	20	35	33	20	
10	35	27	18	32	30	19	

6" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	41	27	47	45	28	Vertical Clip Spacing (inches)
4	48	38	26	45	42	26	
5	48	37	25	43	40	25	
6	48	35	24	41	38	24	
7	48	33	22	39	36	23	
8	46	32	21	37	35	22	
10	41	29	20	34	32	20	

5" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	42	28	48	46	28	Vertical Clip Spacing (inches)
4	48	40	27	47	44	27	
5	48	38	26	44	42	26	
6	48	37	25	43	40	25	
7	48	35	24	41	39	24	
8	48	34	23	39	37	23	
10	46	31	21	37	34	21	

4" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	43	29	48	47	29	Vertical Clip Spacing (inches)
4	48	41	28	48	45	28	
5	48	40	27	47	44	27	
6	48	38	26	45	42	26	
7	48	37	25	43	41	25	
8	48	36	24	42	39	24	
10	48	34	23	39	37	23	

3" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	⅝"	½"	¾"	⅝"	½"	
3	48	44	30	48	48	30	Vertical Clip Spacing (inches)
4	48	43	29	48	47	29	
5	48	42	28	48	46	28	
6	48	41	27	47	45	28	
7	48	39	27	46	43	27	
8	48	38	26	45	42	26	
10	48	37	25	43	40	25	

UP TO 100 psf SPECIFIED WIND

9" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	⅝"	½"	¾"	⅝"	½"	
3	46	31	21	37	35	21	Vertical Clip Spacing (inches)
4	43	30	20	34	32	20	
5	41	28	19	32	31	19	
6	38	26	18	31	29	18	
7	36	25	17	29	27	17	
8	34	24	16	28	26	16	
10	27	22	15	25	24	15	

8" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	⅝"	½"	¾"	⅝"	½"	
3	47	32	22	37	35	22	Vertical Clip Spacing (inches)
4	44	30	21	35	33	21	
5	42	29	19	34	32	20	
6	40	27	18	32	30	19	
7	38	26	18	30	29	18	
8	36	25	17	29	27	17	
10	30	23	15	27	25	15	

7" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	33	22	38	36	22	Vertical Clip Spacing (inches)
4	45	31	21	36	34	21	
5	43	30	20	35	33	20	
6	41	28	19	33	31	19	
7	40	27	18	32	30	18	
8	38	26	18	30	29	18	
10	35	24	16	28	26	16	

6" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	34	23	39	37	23	Vertical Clip Spacing (inches)
4	47	32	22	37	35	22	
5	45	31	21	36	34	21	
6	43	30	20	34	32	20	
7	41	28	19	33	31	19	
8	40	27	18	32	30	19	
10	37	25	17	30	28	17	

5" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	34	23	40	38	23	Vertical Clip Spacing (inches)
4	48	33	22	39	36	23	
5	46	32	22	37	35	22	
6	45	31	21	36	34	21	
7	43	30	20	35	33	20	
8	42	29	19	34	32	20	
10	39	27	18	31	30	18	

4" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	35	24	41	39	24	Vertical Clip Spacing (inches)
4	48	34	23	40	38	23	
5	48	33	22	39	36	23	
6	47	32	22	37	35	22	
7	45	31	21	36	34	21	
8	44	30	21	35	33	21	
10	42	29	19	34	32	20	

3" Wall Assembly

Cladding Weight (psf)	Exterior DFP			CSP			
	¾"	5/8"	½"	¾"	5/8"	½"	
3	48	36	24	42	40	25	Vertical Clip Spacing (inches)
4	48	35	24	41	39	24	
5	48	34	23	40	38	23	
6	48	34	23	39	37	23	
7	48	33	22	38	36	22	
8	47	32	22	37	35	22	
10	45	31	21	36	34	21	



APPENDIX - FASTENER TECHNICAL DATA SHEETS

ACS-HWH MD2 (Steel Stud)

ACS-HWH MD3 (Angle/Girt)

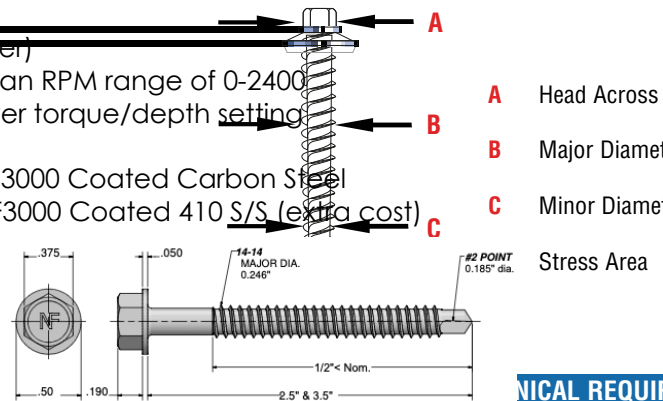
ACS-HWH CONCRETE/CMU (Concrete/CMU)

ACS-HWH MT (Wood Stud/Plywood)

ACS-HWH MD2 - MASTER DRILLERS® – TECHNICAL DATA (USA)

DIMENSIONAL PROPERTIES

- Manufactured by Leland Industries Inc.
- Standard Hex Head with Integrated Washer (5/8" Driver)
- For target fastener performance, driver should have an RPM range of 0-2400
- Fastener capacity reduced by overdriving – limit driver torque/depth setting
- Availability:
ACS U-Clip™: #14-14, #2 Drill Point, 2 1/2" Length, NZF3000 Coated Carbon Steel
 #14-14, #2 Drill Point, 2 1/2" Length, NZF3000 Coated 410 S/S (extra cost)



FASTENER PERFORMANCE¹

FASTENER MECHANICAL PROPERTIES

	Carbon Steel	410 Stainless Steel
Minimum Tensile Strength (lbs)	4300	Minimum 4300
Minimum Torsional Strength (in-lbs)	156	160
Minimum Shear Strength (lbs)	2580	2610

TENSION/SHEAR – STEEL ATTACHMENT ALLOWABLE STRESS DESIGN (ASD)

Base Steel Attachment ²	20 Ga.	18 Ga.	16 Ga.
Tension (lbs) ³	133.3	211.0	285.2
Shear (lbs) ⁴	270.5	402.6	599.8

SHEET STEEL PULLOVER – BASED ON NOMINAL 1/2" FASTENER HEAD DIAMETER⁵ ALLOWABLE STRESS DESIGN (ASD)

Steel Type ²	16 Ga	18 Ga	20 Ga	22 Ga	24 Ga
Galv. Carbon Steel	849.7	677.0	519.4	448.9	358.8
Stainless Steel	1128.8	899.5	690.1	596.3	476.7

SHEET STEEL DESIGN THICKNESS REFERENCE⁶

Nominal Gauge	16 Ga	18 Ga	20 Ga	22 Ga	24 Ga
Thickness – mm	1.519	1.214	0.912	0.759	0.607
Thickness - Inches	0.0598	0.0478	0.0359	0.0299	0.0239

¹ All test results and suggestions are based on laboratory tests and/or relevant Canadian Codes. Specific job site conditions should be taken into consideration when specifying the proper fastener. Because applications vary, ACS Composite Systems Inc. assumes no liability for use of this information.

² Steel Grades: A36 Galvanized Steel Fy = 33 ksi, Fu = 60 ksi; A304 Stainless Steel Fy = 33 ksi, Fu = 80 ksi

³ Calculated based on S100 K2.1.2 Tests for Special Cases, Allowable Strength Design (ASD)

⁴ Calculated based on S100-16 J4.3 with Outer Material 18 Gauge Stainless Steel, Base Steel as Noted, and FS = 3.0

⁵ Calculated based on S100-16 J4.4.2

⁶ Steel to Conform to the Requirements of AISI S100-16

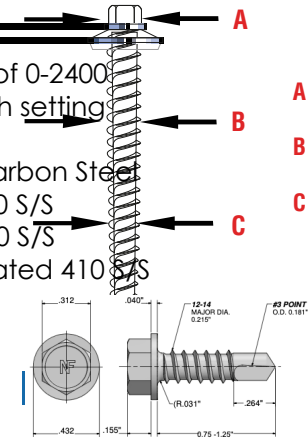
SHEAR STRENGTH - SEE INSIDE BACK COVER

FOR MECHANICAL PROPERTIES PLEASE REFER TO PAGE 5

ACS-HWH MD3 - MASTER DRILLERS® – TECHNICAL DATA (USA)

DIMENSIONAL PROPERTIES

- Manufactured by Leland Industries Inc.
- Standard Hex Head with Integrated Washer (5/16" Driver)
- For target fastener performance, driver should have an RPM range of 0-2400
- Fastener capacity reduced by overdriving – limit driver torque/depth setting
- Availability:
 - ACS U-Clip™:** #12-14, #3 Drill Point, 3/4" Length, NZF3000 Coated Carbon Steel
 - ACS A-Clip®:** #12-14, #3 Drill Point, 3/4" Length, NZF3000 Coated 410 S/S
 - ACS S-Clip®:** #12-14, #3 Drill Point, 3/4" Length, NZF3000 Coated 410 S/S
 - ACS Spline System™:** #12-14, #3 Drill Point, 1 1/4" Length NZF3000 Coated 410 S/S



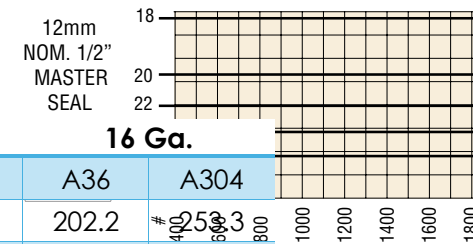
FASTENER PERFORMANCE¹

FASTENER MECHANICAL PROPERTIES

	Carbon Steel	410 Stainless Steel
Minimum Tensile Strength (lbs)	3500	4300
Minimum Torsional Strength (in-lbs)	88	130
Minimum Shear Strength (lbs)	2100	2590

TENSION/SHEAR – STEEL ATTACHMENT ALLOWABLE STRESS DESIGN (ASD)

Base Steel Attachment Gauge	20 Ga.		18 Ga.		16 Ga.	
Base Steel Attachment Material ²	A36	A304	A36	A304	A36	A304
Tension (lbs) ³	123.0	123.0	161.1	184.7	202.2	253.3
Shear (lbs) ⁴	247.9	257.3	369.0	453.7	539.8	541.0



SHEET STEEL PULLOVER – BASED ON NOMINAL 0.42" FASTENER HEAD DIAMETER⁵ ALLOWABLE STRESS DESIGN (ASD)

Steel Type ²	16 Ga	18 Ga	20 Ga	22 Ga	24 Ga
Galv. Carbon Steel	705.2	561.9	431.1	372.6	297.8
Stainless Steel	936.9	746.6	572.7	494.9	395.6

SHEET STEEL DESIGN THICKNESS REFERENCE⁶

Nominal Gauge	16 Ga	18 Ga	20 Ga	22 Ga	24 Ga
Thickness – mm	1.519	1.214	0.912	0.759	0.607
Thickness – Inches	0.0598	0.0478	0.0359	0.0299	0.0239

¹ All test results and suggestions are based on laboratory tests and/or Codes. Specific job site conditions should be taken into consideration when specifying the proper fastener. Because applications vary, ACS Composite Systems Inc. assumes no liability for use of this information.

² A36 Galvanized Steel Fy = 36 ksi, Fu = 60 ksi, A 304 Stainless Steel Fy = 33 ksi, Fu = 80 ksi

³ Calculated based on Lesser of Leland Published Data or AISI S100 J4.4.1 with FS = 3.0

⁴ Calculated based on Lesser of Leland Published Data or AISI S100 J4.3 with FS = 3.0

⁵ Calculated based on AISI S100-16 J4.4.2

⁶ Steel to Conform to the Requirements of CSA S136/AISI S100-16 – North American Specification for the Design of Cold-Formed Steel Structural Members

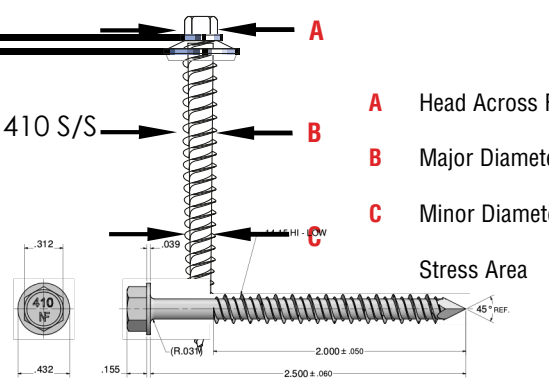
ACS-HWH Concrete/CMU Screw – TECHNICAL DATA (USA)

DIMENSIONAL PROPERTIES

- Manufactured by Leland Industries Inc.
- Standard Hex Head with integrated washer (3/16" Driver)
- Availability:
ACS U-Clip™: #14 – 15 (TPI) x 2 1/2" Length NZF3000 Coated 410 S/S

FASTENER PERFORMANCE¹

	410 Stainless Steel
Minimum Tensile Strength (lbs)	1750
Minimum Torsional Strength (in-lbs)	160
Minimum Shear Strength (lbs)	2900



CONCRETE ATTACHMENT

- For target fastener performance, driver should have an RPM range of 0-2400
- Requires concrete pilot hole with 3/16" carbide-tipped drill bit
- Tension & Shear values for concrete application are based on minimum anchor spacing of 3" (12 x Diameter) and require minimum 3" Edge Distance

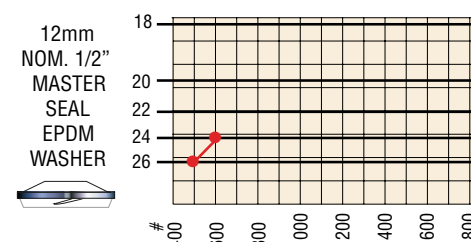
USA ALLOWABLE STRESS DESIGN (ASD) FASTENER VALUES

Concrete Strength	f'c ≥ 4000 psi
Withdrawal (lbs) ²	653
Shear (lbs) ³	341

STANDARD MECHANICAL REQUIREMENTS FOR LELAND AVERAGE VALUES SEE PAGE 23

Minimum Tensile Strength	Carbon 2350 lb
Minimum Torsional Strength	65 in.-lb
Minimum Shear Strength	1460 lb

PULL-OVER STRENGTH



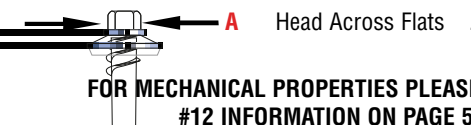
CMU BLOCK ATTACHMENT⁴

- For target fastener performance, driver should have an RPM range of 0-2400
- Requires CMU pilot hole with 3/16" carbide-tipped drill bit
- Tension & Shear based on minimum 3" Anchor Spacing & 3 1/2" End/Edge Distance
- Anchors Must Fall Within Face Shell (No Mortar Joint Attachments Permitted)**

REFER TO PAGE 8 FOR
PULL-OUT STRENGTH TECHNICAL

USA ALLOWABLE STRESS DESIGN (ASD) FASTENER VALUES

CMU Strength	f'c ≥ 2000 psi
Withdrawal (lbs) ⁵	107
Shear (lbs) ⁶	163



#10 NYLON HEADED MASTER FOR MECHANICAL PROPERTIES PLEASE SEE #10 INFORMATION ON THIS PAGE

¹ All test results and suggestions are based on laboratory tests and/or relevant Codes. Specific job site conditions should be taken into consideration when specifying the proper fastener. Because applications vary, ACS Composite Systems Inc. assumes no liability for use of this information.

² Calculated with AISI S100-16 K2.1.2 with FS = 2.69 (ASD) using 2 1/2" Fasteners and Min. 2" Embedment

³ Calculated with AISI S100-16 K2.1.2 with FS = 4.03 (ASD) using 2 1/2" Fasteners and Min. 2" Embedment

⁴ CMU Values from Tests Using Standard 8" x 8" x 16" (Nominal) 2000 psi CMU Units

⁵ Calculated with AISI S100-16 K2.1.2 with FS = 5 (ASD) using 2 1/2" Fasteners and Full Face-Shell Penetration

⁶ Calculated with CSA S136 K2.1.2 with FS = 2.79 (ASD) using 2 1/2" Fasteners and Full Face-Shell Penetration

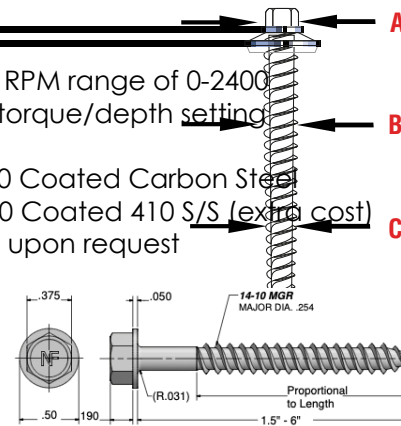
SHEAR STRENGTH - SEE INSIDE BACK COVER

All test results and suggestions are based on laboratory tests and/or relevant Codes. Specific job site conditions should be taken into consideration when specifying the proper fastener.

ACS-HWH MT - MASTER GRIPPERS® – TECHNICAL DATA (USA)

DIMENSIONAL PROPERTIES

- Manufactured by Leland Industries Inc.
- Standard Hex Head with Integrated Washer (5/8" Driver)
- For target fastener performance, driver should have an RPM range of 0-2400
- Fastener capacity reduced by overdriving – limit driver torque/depth setting
- Availability:
ACS U-Clip™: #14-10, Sharp Point, 2 1/2" Length, NZF3000 Coated Carbon Steel
 #14-10, Sharp Point, 2 1/2" Length, NZF3000 Coated 410 S/S (extra cost)
Mass Timber Applications: Available in 1 1/2" – 6" lengths upon request



A Head Across Flats
B Major Diameter
C Minor Diameter
 Stress Area

FASTENER PERFORMANCE¹

FASTENER MECHANICAL PROPERTIES	(Included w/U-Clip) Carbon Steel	(Extra Cost/Long Lead) 410 Stainless Steel
Minimum Tensile Strength (lbs)	4300	4350
Minimum Torsional Strength (in-lbs)	156	160
Minimum Shear Strength (lbs)	2580	2610

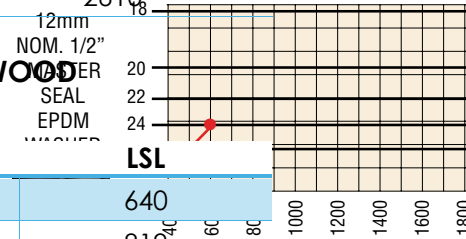
MECHANICAL REQUIREMENTS
 : PAGE 23

Carbon
 2350 lb
 65 in.-lb
 1460 lb

ALLOWABLE STRESS DESIGN (ASD) FASTENER VALUES – DIMENSIONAL LUMBER

- Tabulated Values Based on Normal Duration Loading (1.0)

Dimensional Lumber ² /LSL ³	SPF	D-Fir	LSL
Withdrawal (lbs)	232	302	640
Shear (lbs)	140	150	819



REFER TO PAGE 8 FOR
 PULL-OUT STRENGTH TECHNICAL

ALLOWABLE STRESS DESIGN (ASD) FASTENER VALUES – EXTERIOR GRADE PLYWOOD

- Tabulated Values Based on Normal Duration Loading (1.0)

D-Fir Exterior Grade Plywood ⁴	1/2"	5/8"	3/4"
Withdrawal (lbs)	98	144	211
Shear (lbs)	102	133	163

CSP Exterior Grade Plywood ⁴	1/2"	5/8"	3/4"
Withdrawal (lbs)	98	159	169
Shear (lbs)	85	144	154

FOR MECHANICAL PROPERTIES PLEASE
 INFORMATION ON PAGE 5

#10 NYLON HEADED MASTER
 FOR MECHANICAL PROPERTIES PLEASE
 #10 INFORMATION ON THIS PAGE

¹ All test results and suggestions are based on laboratory tests and/or relevant Codes. Specific job site conditions should be taken into consideration when specifying the proper fastener. Because applications vary, ACS Composite Systems Inc. assumes no liability for use of this information.

² Calculated based on CSA O86 12.11 Wood Screw Connections (ASD) using 2 1/2" Fasteners and Min. 1 1/2" Embedment with FS = 3, all other Code Factors set to 1.0

³ Test used Weyerhaeuser 1.55E Timberstrand LSL x 1 3/4" and Calculated Based on S100 K2.1.2 Tests for Special Cases, Allowable Strength Design (ASD), using 2 1/2" Fastener and Minimum 1 1/2" Embedment

⁴ Calculated based on AISI S100 K2.1.2 Tests for Special Cases, Allowable Strength Design (ASD) – Tapered Screw Tip Must Clear Inside of Plywood Face

SHEAR STRENGTH - SEE INSIDE BACK COVER